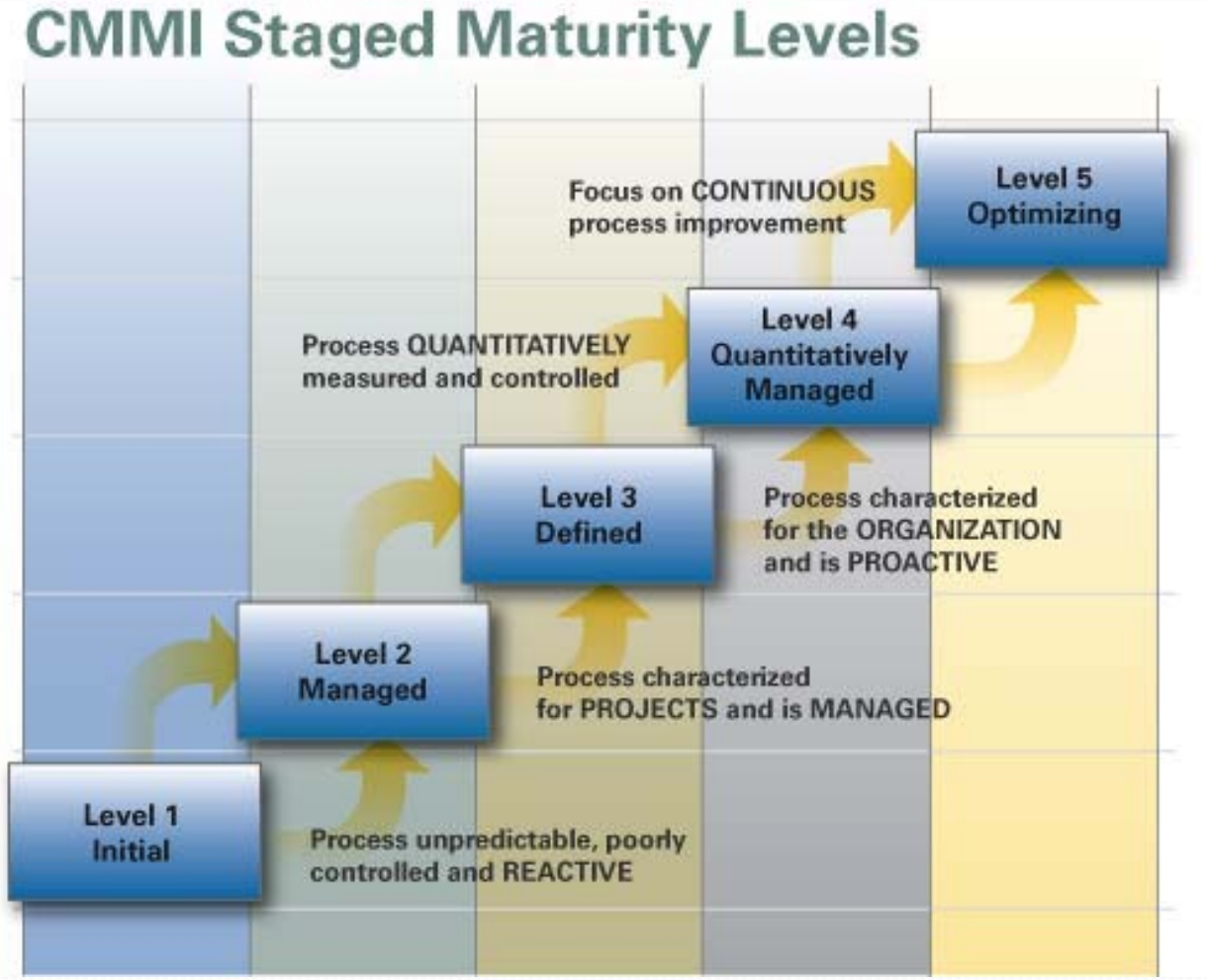
Agile Quality Management Techniques Complementing CMMI®

Presented by Jim Jamieson

Background

- CMMI® aims to define and mature project processes by focusing on
  - Continuous quality and performance improvements
  - Deliver Quality Software
- Agile software development focuses on
  - Rapidly delivering high-quality software
  - That meets both the needs of the customer and
  - The goals of the organization over multiple iterations of the development lifecycle.
- The difference?
  - CMMI® defines what you need to do, agile defines how to quickly adapt software in a changing environment

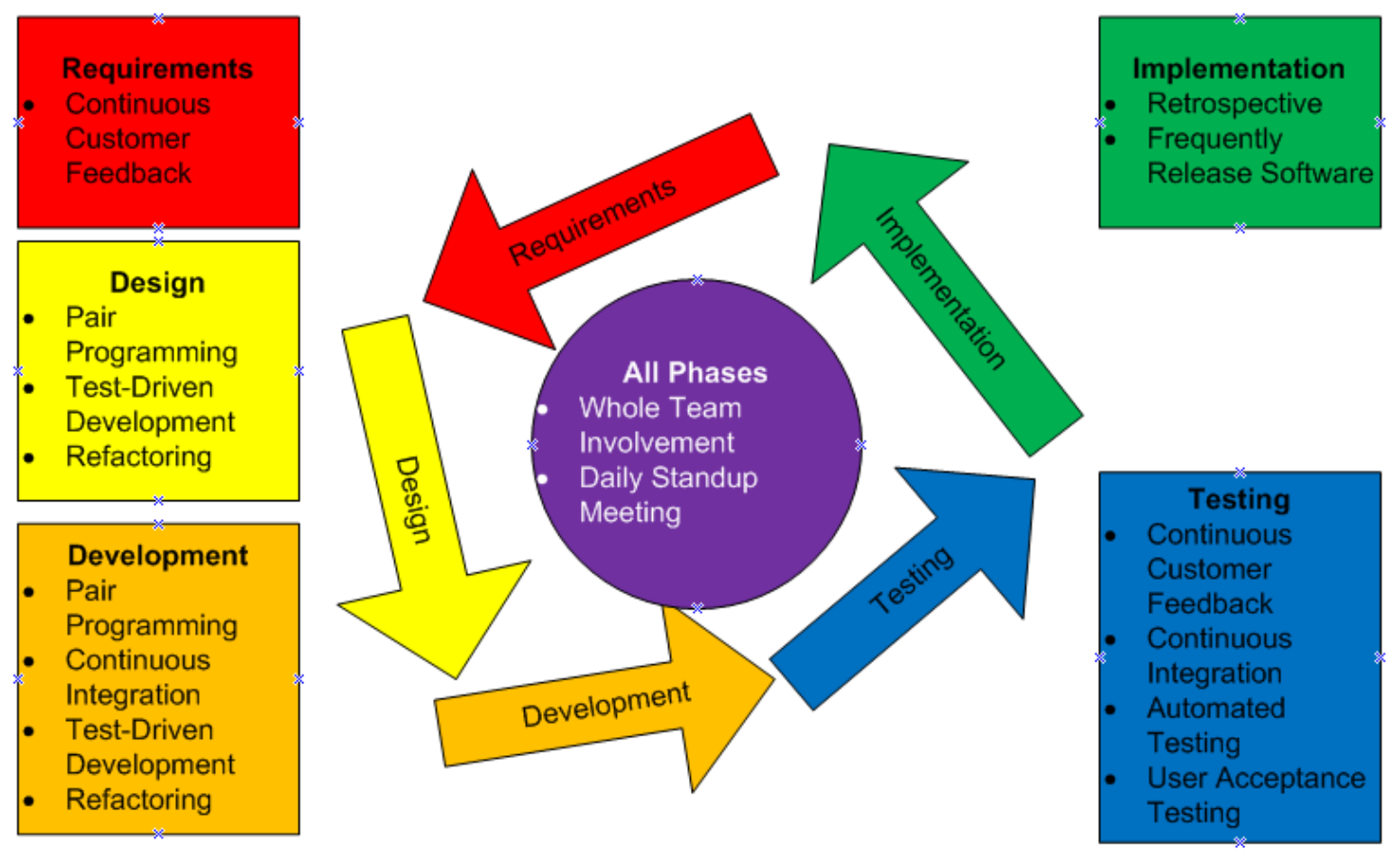
CMMI® Model


CMMI Staged Maturity Levels
Level 5
Optimizing
Focus on CONTINUOUS
process improvement
Level 4
Quantitatively
Managed
Process QUANTITATIVELY
measured and controlled
Level 3
Defined
Process characterized
for the ORGANIZATION
and is PROACTIVE
Level 2
Managed
Process characterized
for PROJECTS and is MANAGED
Level 1
Initial
Process unpredictable, poorly
controlled and REACTIVE

Agile Techniques

- Whole team involvement
- Continuous customer feedback
- Pair programming
- Continuous integration
- Automated testing
- Test-driven development
- Refactoring
- User acceptance testing
- Retrospective
- Daily standup meeting
- Frequently release software

Agile Techniques in the SDLC



Whole Team Involvement

- Benefits
  - Better planning estimates
  - More detailed requirements
  - Gain commitment
  - Everyone has the same story for how the system works
  - The team decides what it means to be “done”
- Potential Pitfalls
  - Increase in communication channels
  - Schedule delay
- Relationship to CMMI®
  - PMC, IPM, RD, REQM, PI, TS, VER, VAL
  - All phases of the SDLC result in increased involvement and commitment by the team to deliver the product

Continuous Customer Feedback

- Benefits
  - Willingness to discuss all project aspects openly
  - Quickly adapt application to suit customer's needs for increased business value
- Potential Pitfalls
  - Key stakeholders may not wish to be involved
    - Changing your approach
    - Demonstrating commitment
- Relationship to CMMI®
  - PMC, IPM, RD, VAL
  - By having the customer help to develop requirements they are better prepared to identify defects in the product

Pair Programming

- Benefits
  - Helps developers stay focused and think through things aloud
  - Produces higher quality code and reduces defects
  - Reduces maintainability
  - Greater mentoring and teaching opportunities
  - Fosters collective code ownership
- Potential Pitfalls
  - Not everyone works well together, should not be forced
- Relationship to CMMI®
  - TS, VER, VAL
  - Ensures best technical decisions are made and work can easily be checked to ensure it adheres to standards
  - Does not always need to be programming could be “unit testing”

Continuous Integration

- Benefits
  - Can be used to identify defects, integration errors, coding standard variances, and failed tests earlier in the development process
  - Code is always “ready” for the customer
  - Provides continual feedback on the state of the application
- Potential Pitfalls
  - If everyone is not on board, then developers may be unwilling to fix something that is not their responsibility
- Relationship to CMMI®
  - CM, PI, VER
  - Frequent builds of the application ensure code is built the right way and all aspects integrated
  - Can be used to enforce standards

Automated Testing

- Benefits
  - Catches bugs early, when work is fresh
  - Safety net when refactoring
  - When integrated as a part of the build process, they can be run as a part of Continuous Integration
- Potential Pitfalls
  - Automated tests say nothing about the quality of the test
- Relationship to CMMI®
  - VAL: Code is continually validated to ensure it is correct

Test-Driven Development

- Benefits
  - Automated tests written first that will fail, code is written, tests run again to ensure code passes
  - Forces developer to think about how their code will fail
  - Lower defect rate
  - Further requirement identification
- Potential Pitfalls
  - Can slow down development time
  - All developers must agree
- Relationship to CMMI®
  - VAL, TS: All solutions support automated tests to ensure the functionality is correct

Refactoring

- Benefits
  - Small transformations that constantly improve the code for all developers
  - Automated tests can support refactoring
  - Code does not degrade over time, easy to understand, maintain, and change
- Potential Pitfalls
  - Perceived lack of business value
- Relationship to CMMI®
  - PI/TS: Provides strategy for when to refactor by focusing on small transformations

User Acceptance Testing

- Benefits
  - Customers verify the specification they provided the developers has been met
  - Defects identified and fixed prior to release
- Potential Pitfalls
  - Customer schedule can drive when and how often UAT is performed
- Relationship to CMMI®
  - VAL: Customer validates product frequently to ensure business requirements are met

Retrospective

- Benefits
  - Improvements to project processes can continually be identified
  - Understanding where something is essential for improving quality
- Potential Pitfalls
  - Too many suggestions can actually hinder improvement
- Relationship to CMMI®
  - PP, PMC: Project is continually monitored to ensure the plans are met and an identified weakness will then lead to improvements for the next cycle

Daily Standup Meeting

- Benefits
  - Discussion of obstacles leads to resolutions
  - Everyone is on the same page with the project status
- Potential Pitfalls
  - Potential to become too detailed, must remain concise
- Relationship to CMMI®
  - IPM, PMC, RSKM: Project status including risks and issues faced by the team are discussed daily

Frequently Release Software

- Benefits
  - Customer can frequently evaluate changes to ensure they fit within business requirements
  - Identifies hidden business requirements
  - Increase business value and stakeholder confidence
- Potential Pitfalls
  - Customer rollout process could be long
  - Relies on many other techniques discussed previously
- Relationship to CMMI®
  - RD, TS, VER, VAL, PMC
  - Feeds back into next iteration to identify work to be done

Agile Impact on Software Development

- Automation as much as possible
- Reduction in schedule and cost
- Issues identified earlier in all processes
- Increased customer satisfaction
- Decrease defects
- Introduces more checkpoints where new customer requirements can be added – drives business value
- Companies using these techniques have been certified as high as CMMI® Level 5

Where to Start?

- Start with techniques focused on communication
  - Whole team involvement
  - Continuous customer feedback
  - Retrospective
  - Daily standup meeting
- Move to some easy technical techniques
  - User acceptance testing
  - Frequently release software
  - Continuous integration
- Finally add advanced technical techniques
  - Pair programming
  - Automated testing
  - Refactoring
  - Test-driven development

Where to start?

- For existing projects a few recommendations
  - Whole team involvement
    - As a team identify the story of how the system works to gain commitment from all stakeholders
    - Define “done”
  - Continuous integration
    - Find ways to take build process and development standards to help team verify product is built the right way
  - Automated testing
    - Focused automated tests on difficult business requirements where there are a number of different scenarios and manual testing would be time consuming
  - Refactoring
    - Small/Incremental refactors instead of large “wholesale” changes as business requirements are added/modified

Summary

- Agile techniques can coexists with CMMI®
- Agile techniques can help reduce time to market while delivering higher-quality software
- While the techniques do focus on quality and a reduction in defects they also provide other benefits
  - Flexibility to meet customer needs
  - Maintainability of code
  - Shorter development time
  - Continually add business value

Reference:

- Any questions?

- Jamieson, J.M. & Fallah, M.H. (March 2012). Agile Quality Management Techniques. *Software Quality Professional, Volume 12, Issue 2.*
- http://www.cmmilevels.com/

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